"If you have knowledge, let others light their candles in it."

~ Margaret Fuller

knowledge

CT Imaging of Acute Pancreatitis

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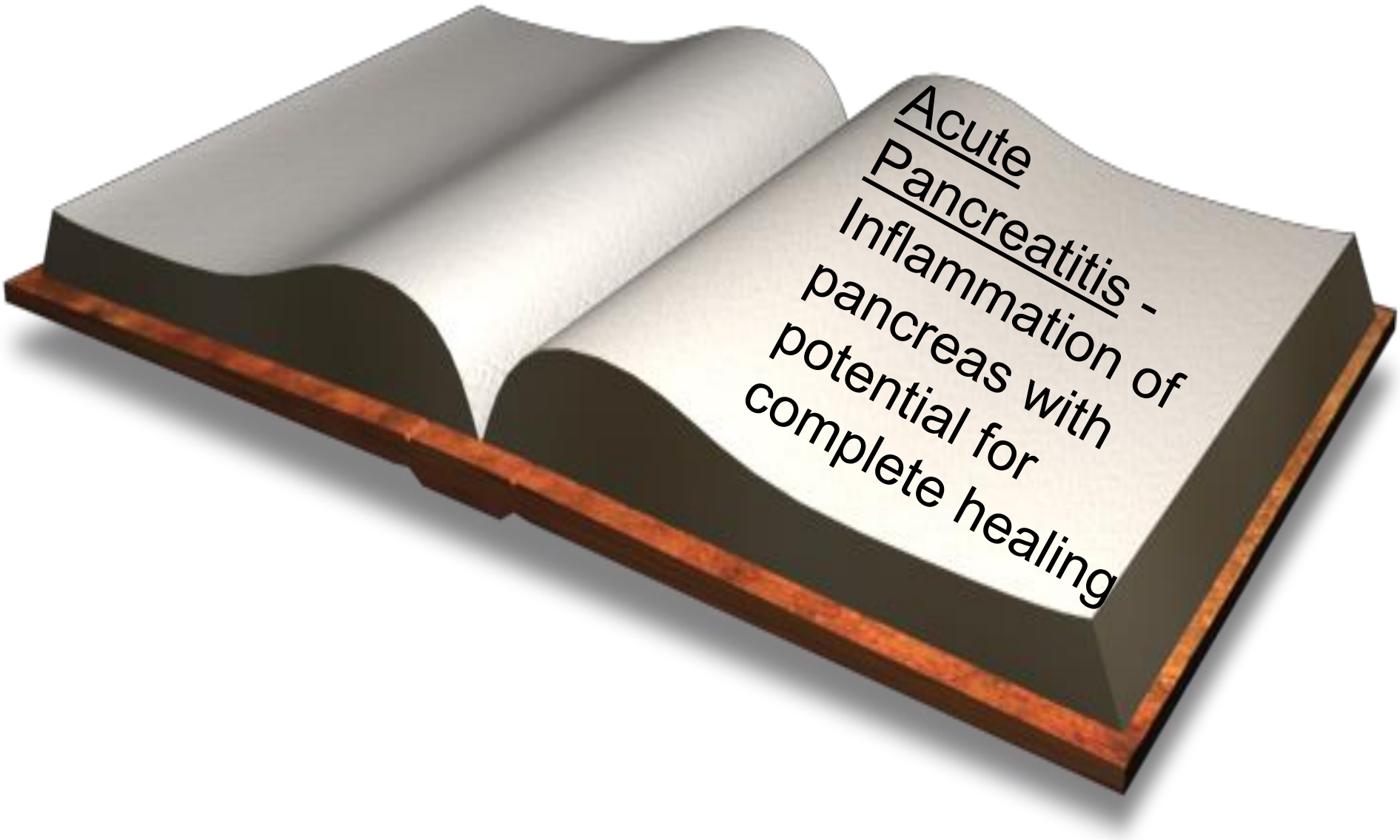
Outline

- Definition
- Epidemiology
- Causal Factors
- CT Evaluation and Findings – Normal and abnormal
- Complications
- Management
- Prognosis

Definition

Definition


Acute Pancreatitis - Inflammation of pancreas with potential for complete healing

Epidemiology

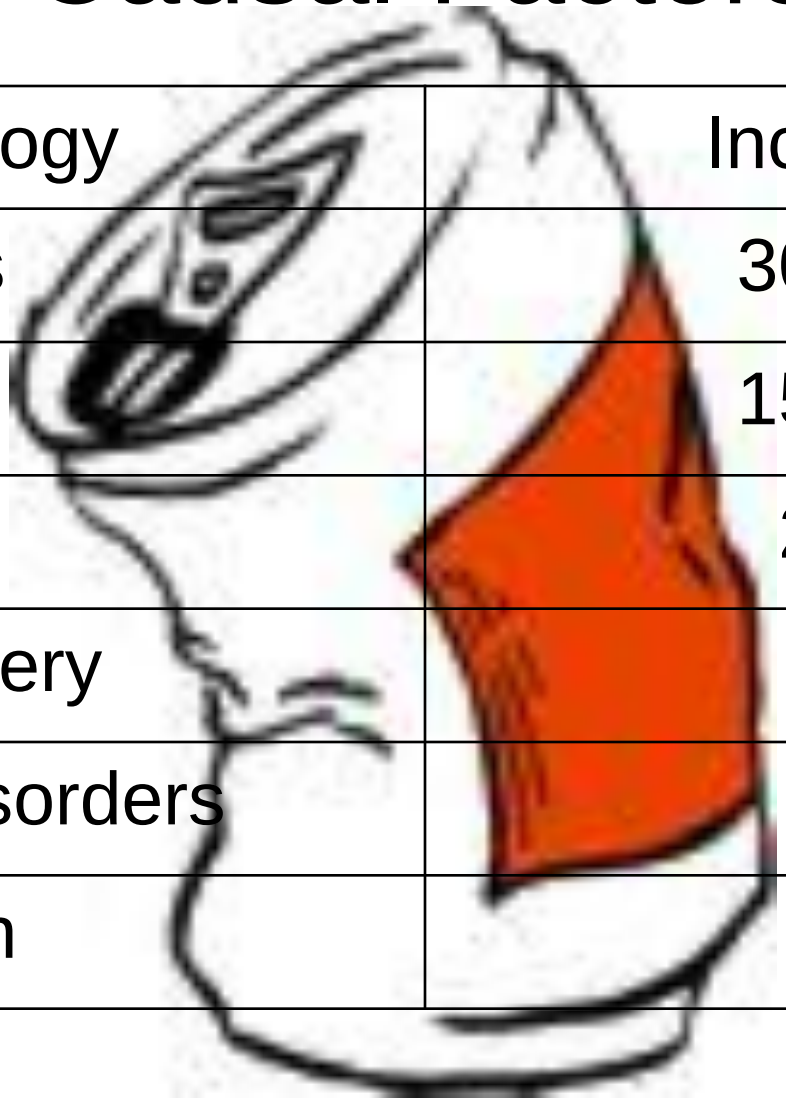
Epidemiology

- 79.8/100,000 per year
- Peak incidence in 4-5th decade

Causal Factors

Causal Factors

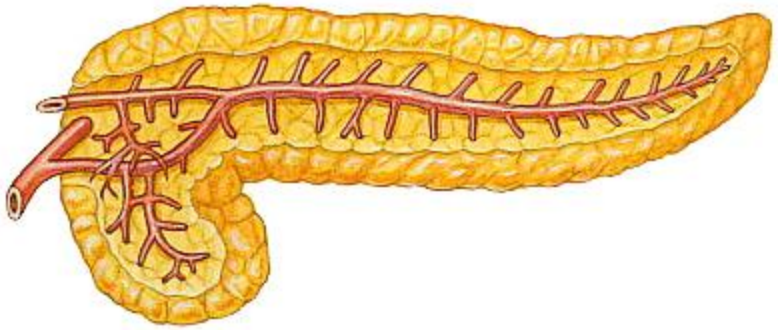
Etiology	Incidence
Cholelithiasis	30-60%
Alcohol	15-30%
Iatrogenic	2-5%
Trauma/Surgery	--
Metabolic Disorders	--
Viral Infection	--

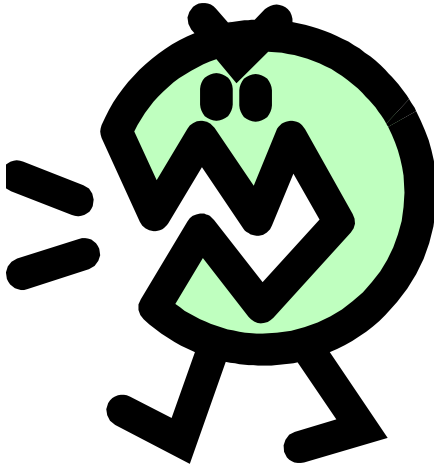


Pathophysiology

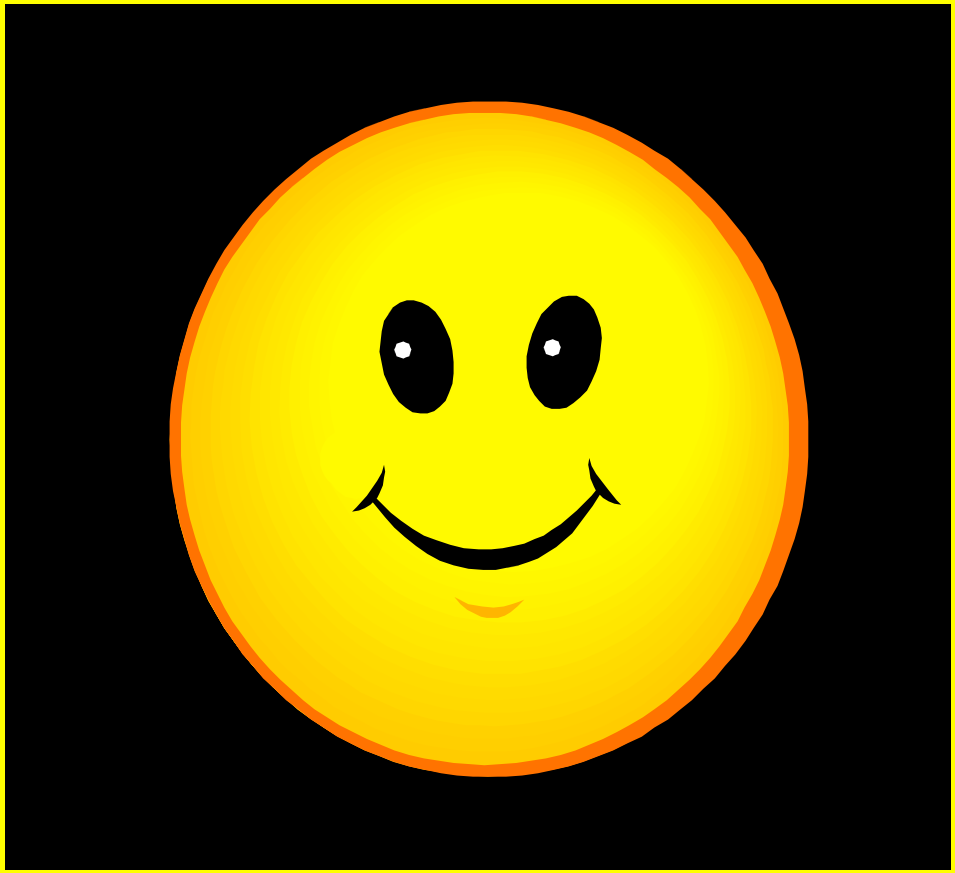
Pathophysiology

- Pancreatic autodigestion, with activated pancreatic enzymes escaping the ductal system and lysing tissue of pancreas and adjacent structures
- Lack of capsule facilitates spread



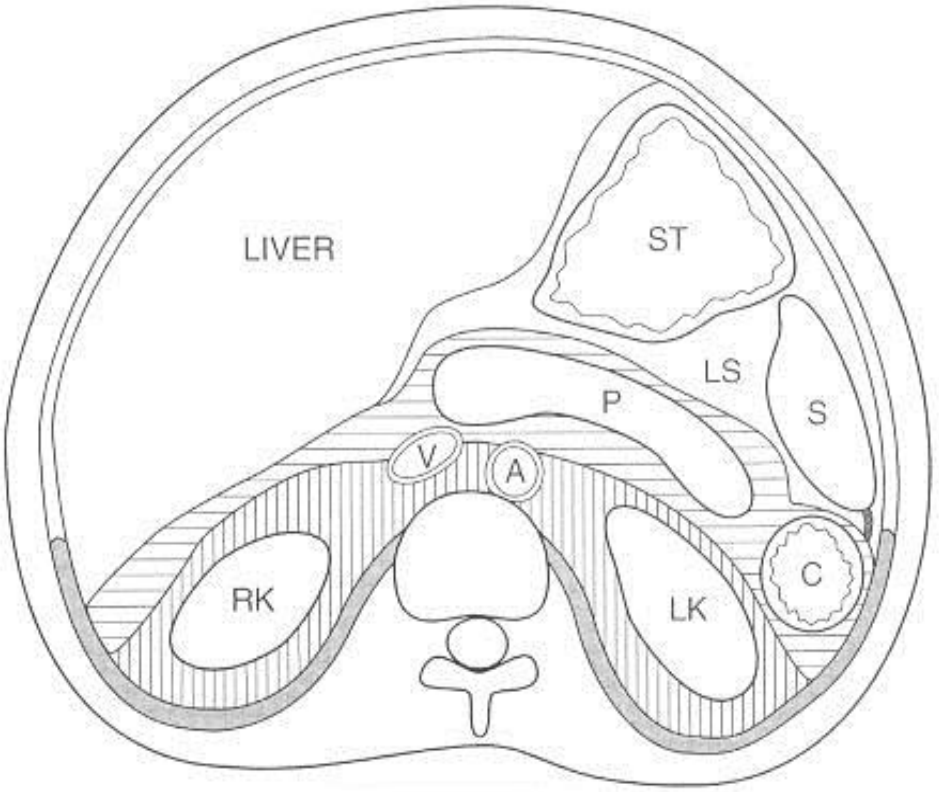


Normal CT Findings



Normal Anatomy by CT

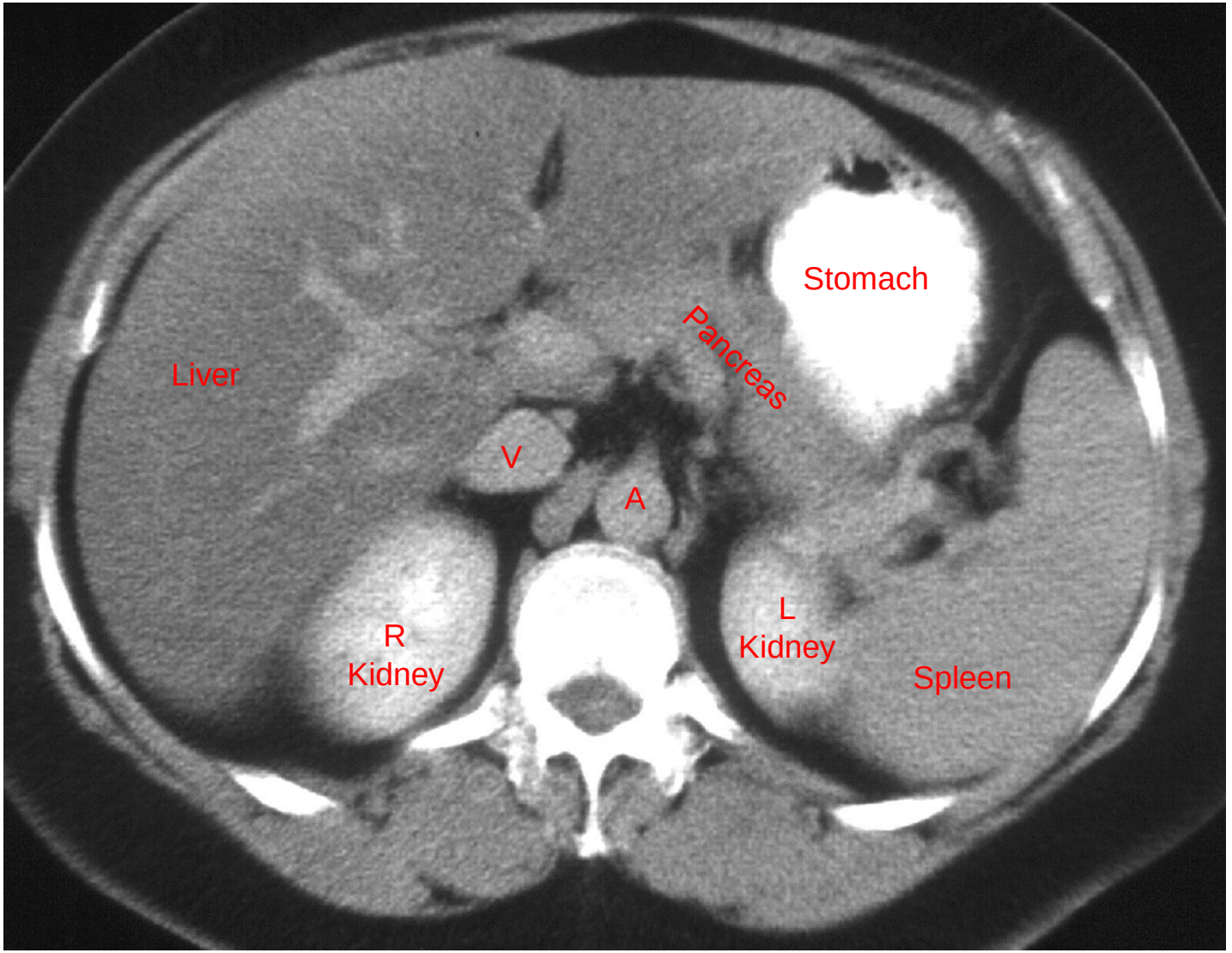
- Pancreas arcing anteriorly over spine
- Head adjacent to duodenum
- Tail extending toward spleen
- Splenic vein posterior to body and tail
- Portal vein confluence immediately posterior & left of pancreatic neck



Normal Morphology by CT

- Pancreatic acini → lobulated contour
- No capsule
- AP dimensions
  - Head 2-2.5 cm
  - Body and tail 1-2 cm
- Pancreatic duct
  - Maximal diameter 3 mm in adults (5 mm in elderly)
  - Empties into ampulla of Vater, along medial aspect of 2nd portion of duodenum

50 year-old woman



CT scans of normal kidneys and pancreas

Evaluation by CT

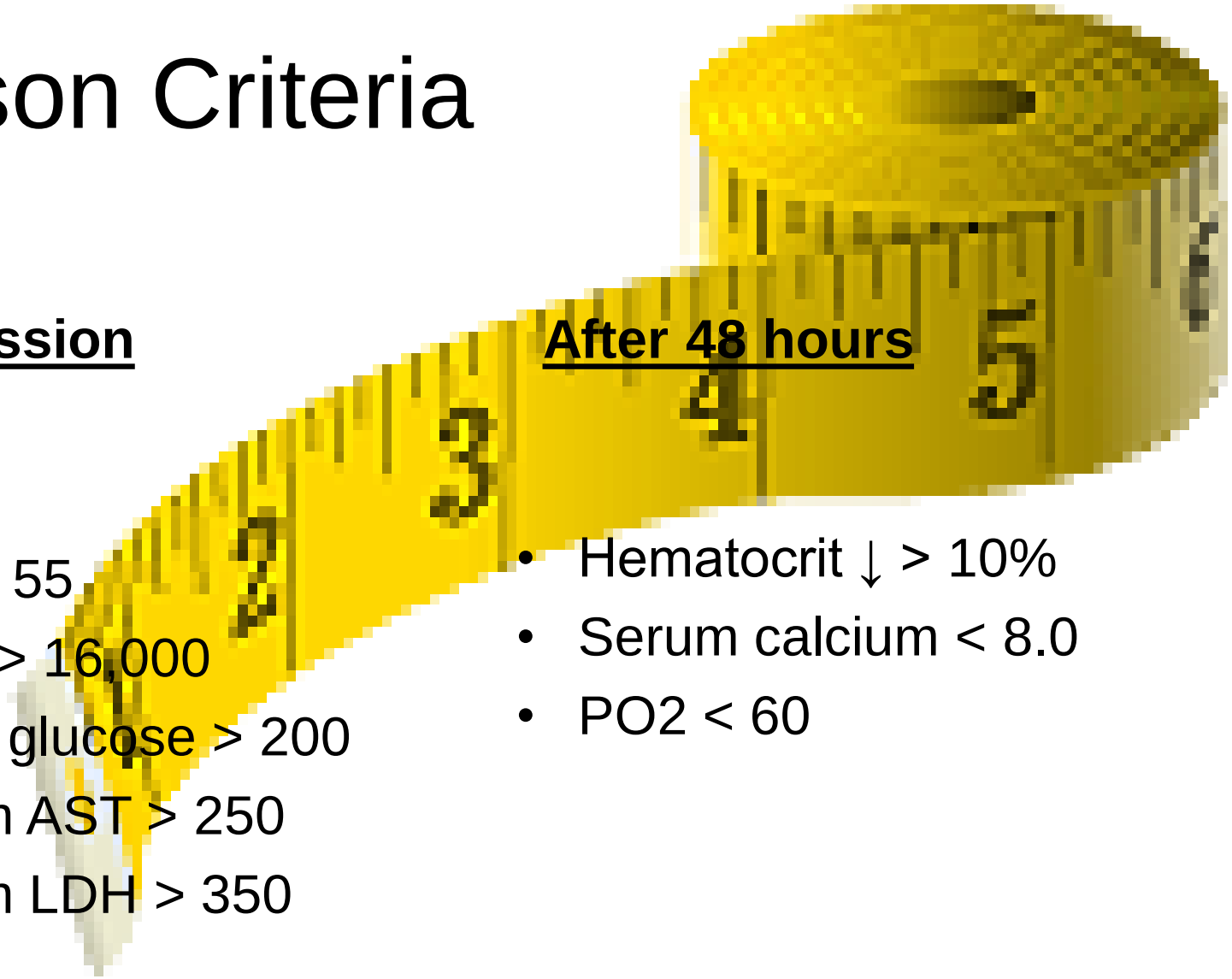
Evaluation of Acute Pancreatitis

- Contrast-enhanced CT is imaging modality of choice
- Oral and IV contrast differentiate pancreatic tissue from adjacent blood vessels and duodenum

Recommendations for Contrast-Enhanced CT

- Clinical diagnosis in doubt
- Severe clinical pancreatitis
- Ranson score > 3
- Failure to rapidly improve within 72 hours of beginning conservative medical therapy
- Initial improvement with later deterioration

Ranson Criteria



At admission

- Age > 55
- WBC > 16,000
- Blood glucose > 200
- Serum AST > 250
- Serum LDH > 350

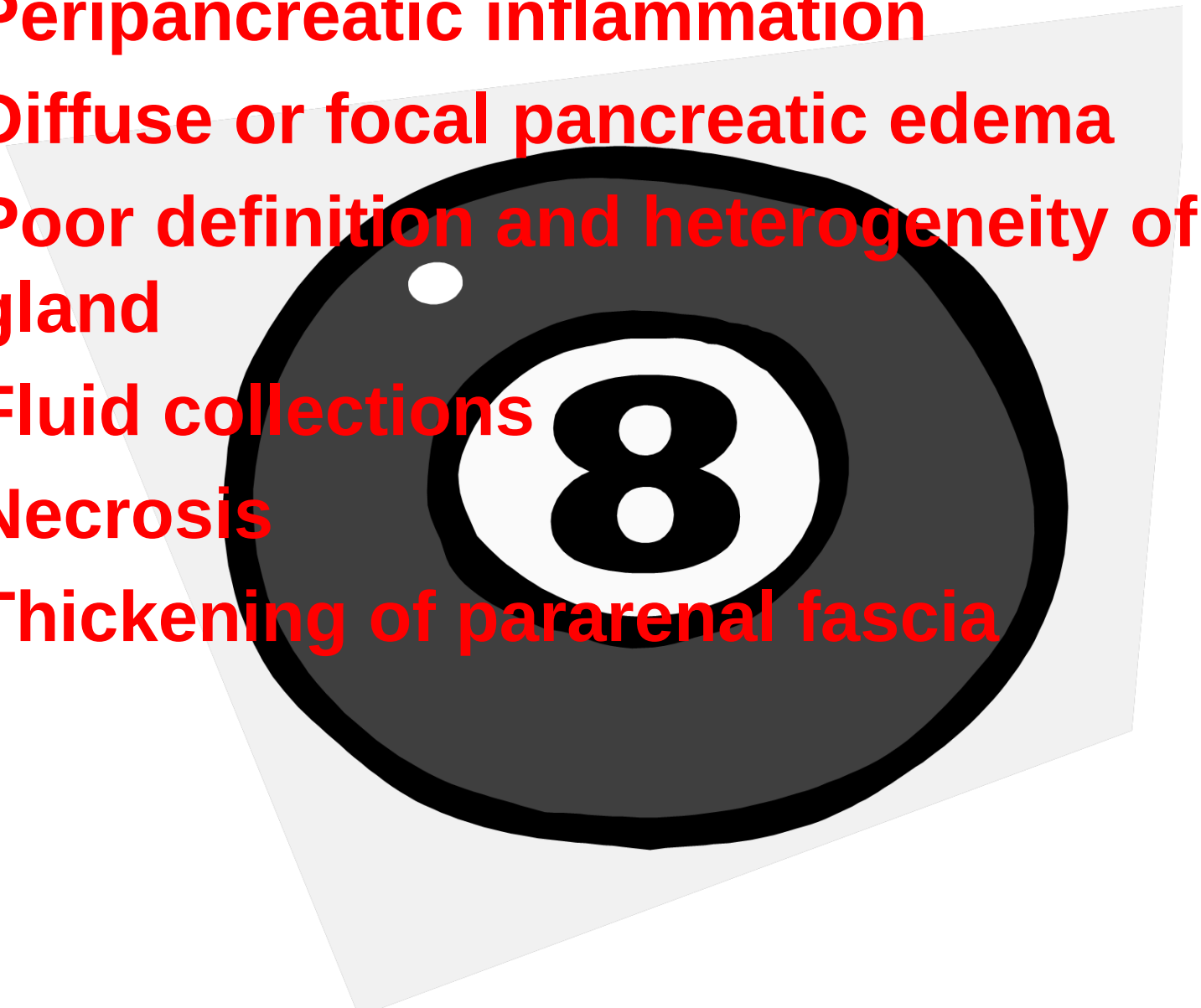
After 48 hours

- Hematocrit ↓ > 10%
- Serum calcium < 8.0
- PO2 < 60

Abnormal CT Findings

Abnormal CT Findings

- **Peripancreatic inflammation**
- **Diffuse or focal pancreatic edema**
- **Poor definition and heterogeneity of gland**
- **Fluid collections**
- **Necrosis**
- **Thickening of pararenal fascia**



Spectrum of Disease

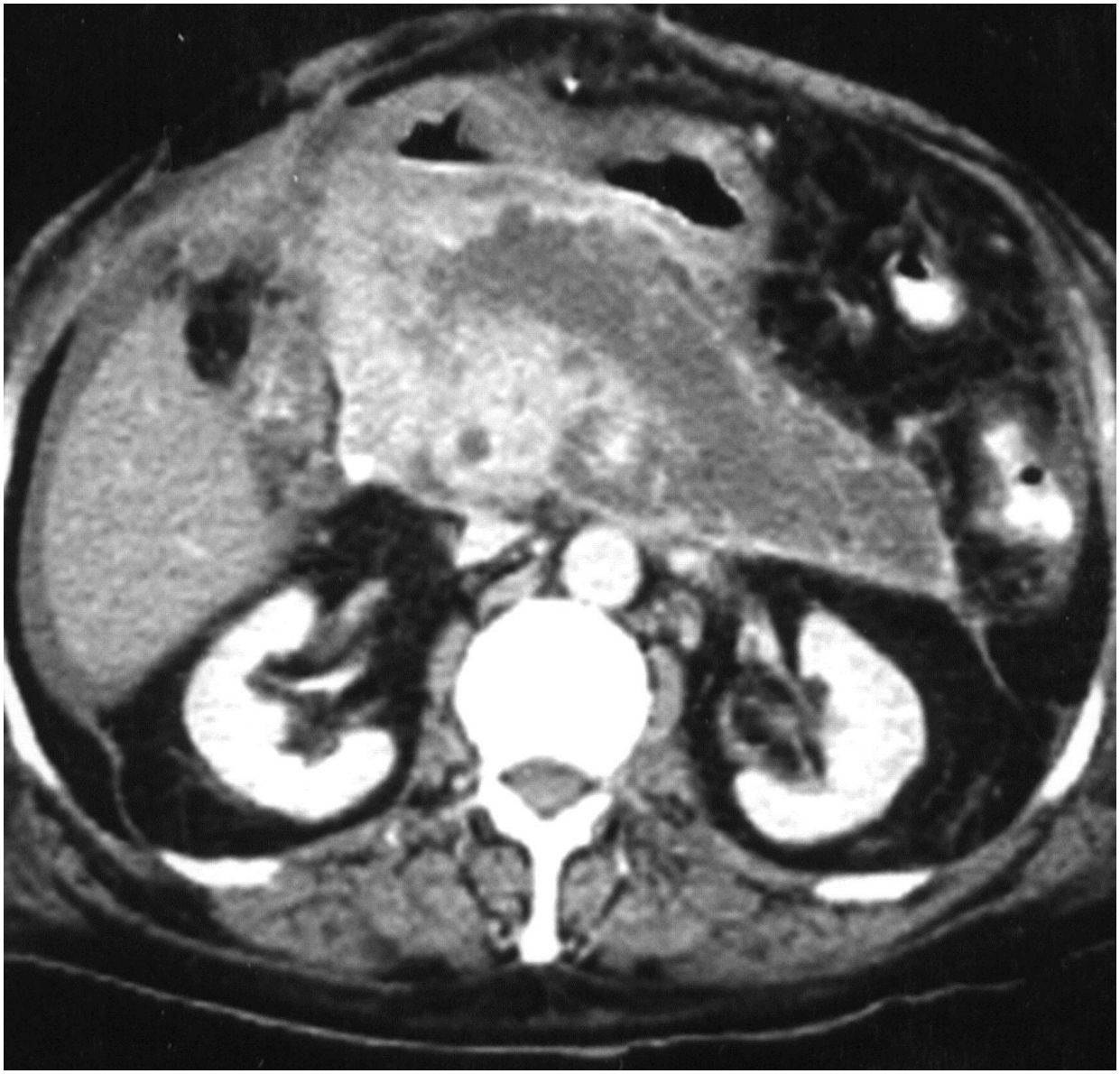
- Mild Cases
  - May be normal or show only mild gland enlargement
- Severe Cases
  - May reveal peripancreatic fluid &/or pancreatic necrosis and phlegmon

Peripancreatic Inflammation/ Pancreatic Edema/ Fluid Collections

Gallstone-induced pancreatitis in 27 year-old woman

Transverse CT scan obtained with intravenous and oral contrast material reveals a large, edematous, homogeneously attenuating (73-HU) pancreas *(1)* and peripancreatic inflammatory changes (white arrows). Although the attenuation values are low, there is no pancreatic necrosis. Calcified gallstones are seen in gallbladder (black arrow). *2* = liver (140 HU).

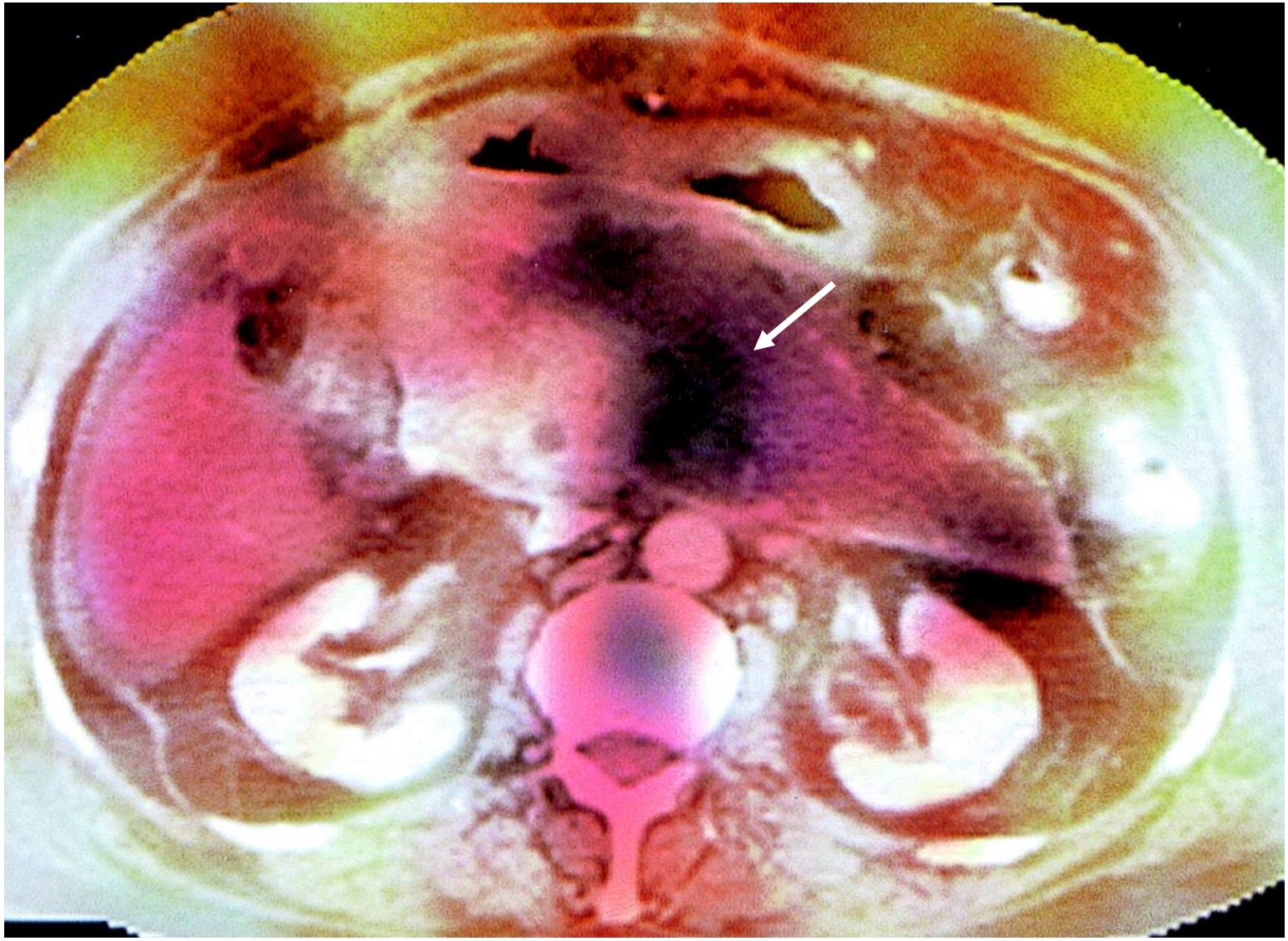
47-year-old man with severe pancreatitis



Fluid collection replacing pancreatic body and tail

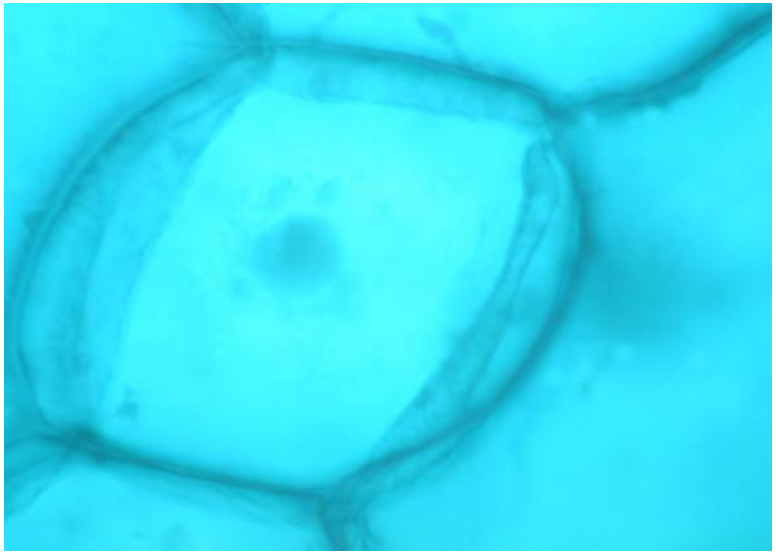
West, J. H. et al. Am. J. Roentgenol. 2002;178:841-846

47-year-old man with severe pancreatitis



47-year-old man with severe pancreatitis. Fusion image of CT scan and gallium study was helpful in localizing infection.

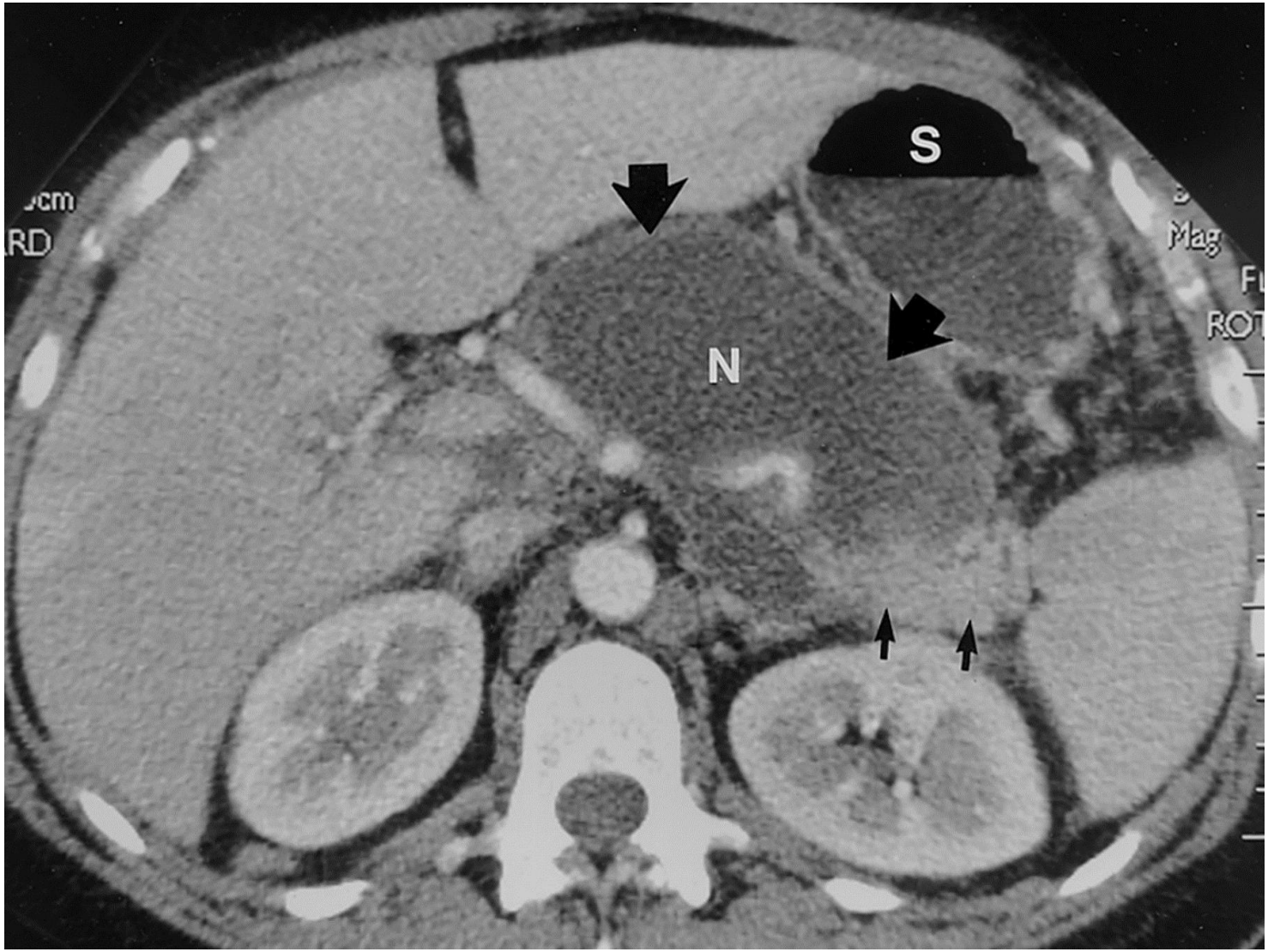
Necrosis



57-year-old man with acute necrotizing pancreatitis and severe back pain

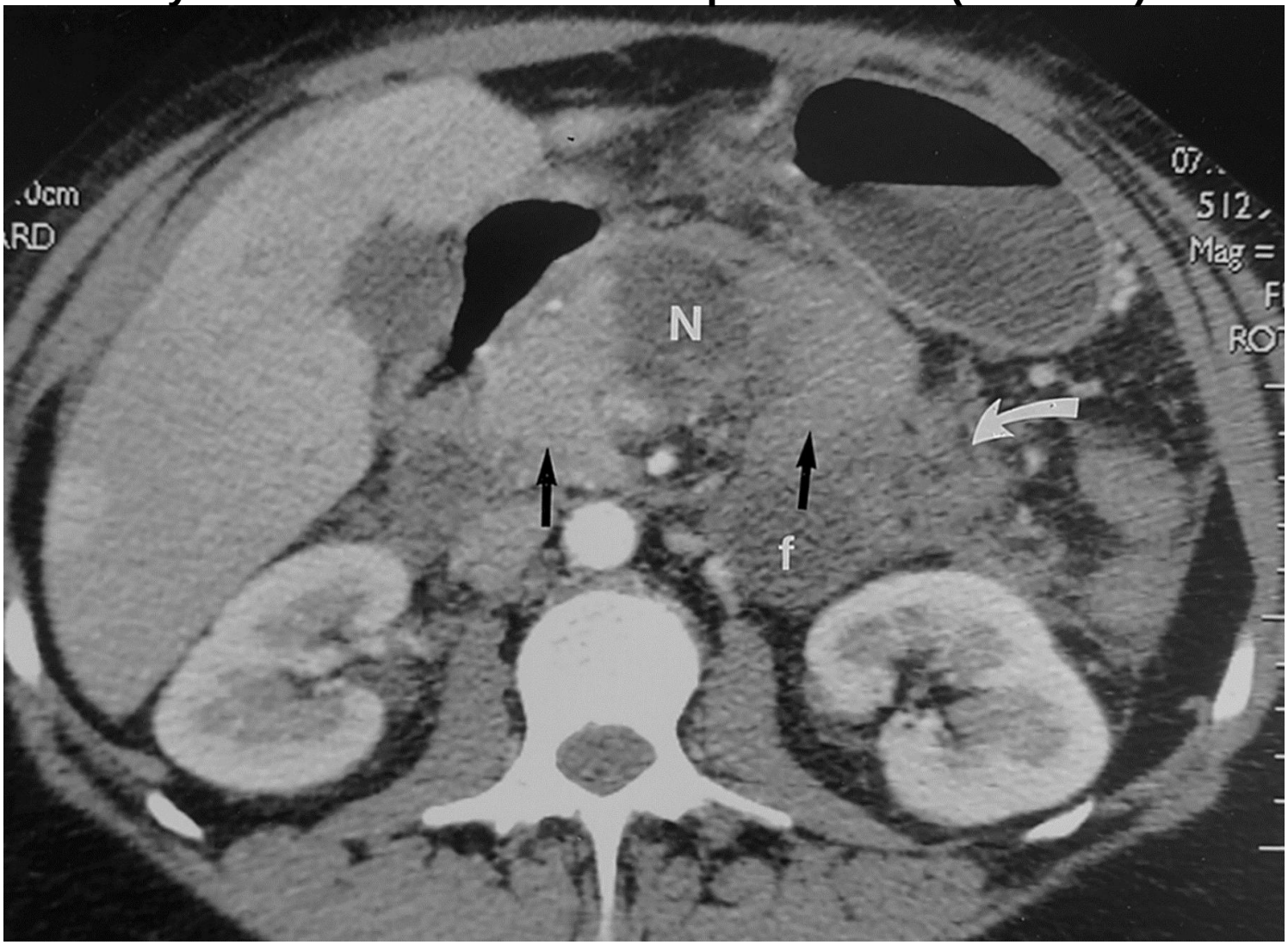
Large region of unenhancement (necrosis) involving most of body and tail of pancreas. Inflammatory fluid is present in anterior pararenal space. Note ascites around liver.

50 year-old woman with acute pancreatitis (1st view)



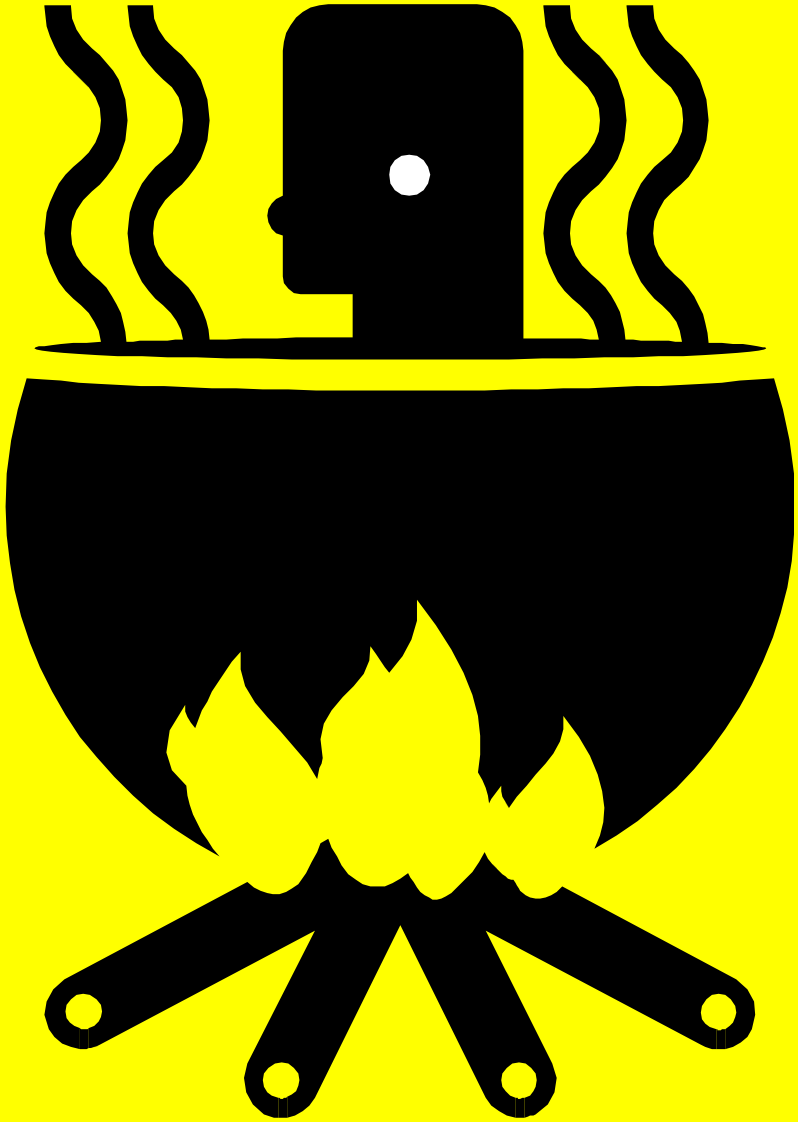
Transverse CT scans obtained with intravenous and oral contrast material reveal an encapsulated fluid collection associated with liquefied necrosis (large straight arrows) in the body of the pancreas. The head, part of the body, and the tail of the pancreas are still enhancing (small straight arrows). *N* = liquefied gland necrosis, *S* = stomach.

50 year-old woman with acute pancreatitis (2nd view)

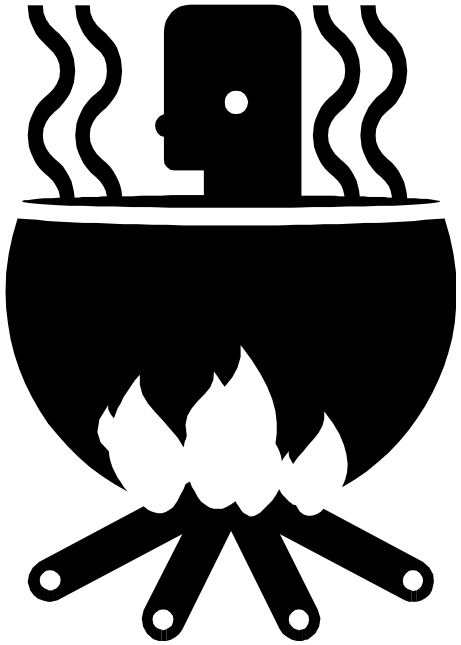


Transverse CT scans obtained with intravenous and oral contrast material. The head, part of the body, and the tail of the pancreas are still enhancing (straight arrows). Residual fluid collections and areas of soft-tissue attenuation (curved arrow) consistent with fat necrosis are seen adjacent to the pancreas. *f* = fluid, *N* = liquefied gland necrosis.

Complications



Complications



- Pancreatic Pseudocysts
- Abscess
- Hemorrhagic Pancreatitis
- Splenic Artery Pseudoaneurysm formation or rupture/ Splenic Venous Thrombosis

Pancreatic Pseudocyst

- Fluid collection surrounded by fibrous capsule but not lined by epithelium
- Occurs in 10% of cases
- Significant % will not resolve spontaneously
- Seen within pancreas and potential spaces with which gland is continuous (lesser sac and left pararenal space)

28 year-old man with pseudocyst

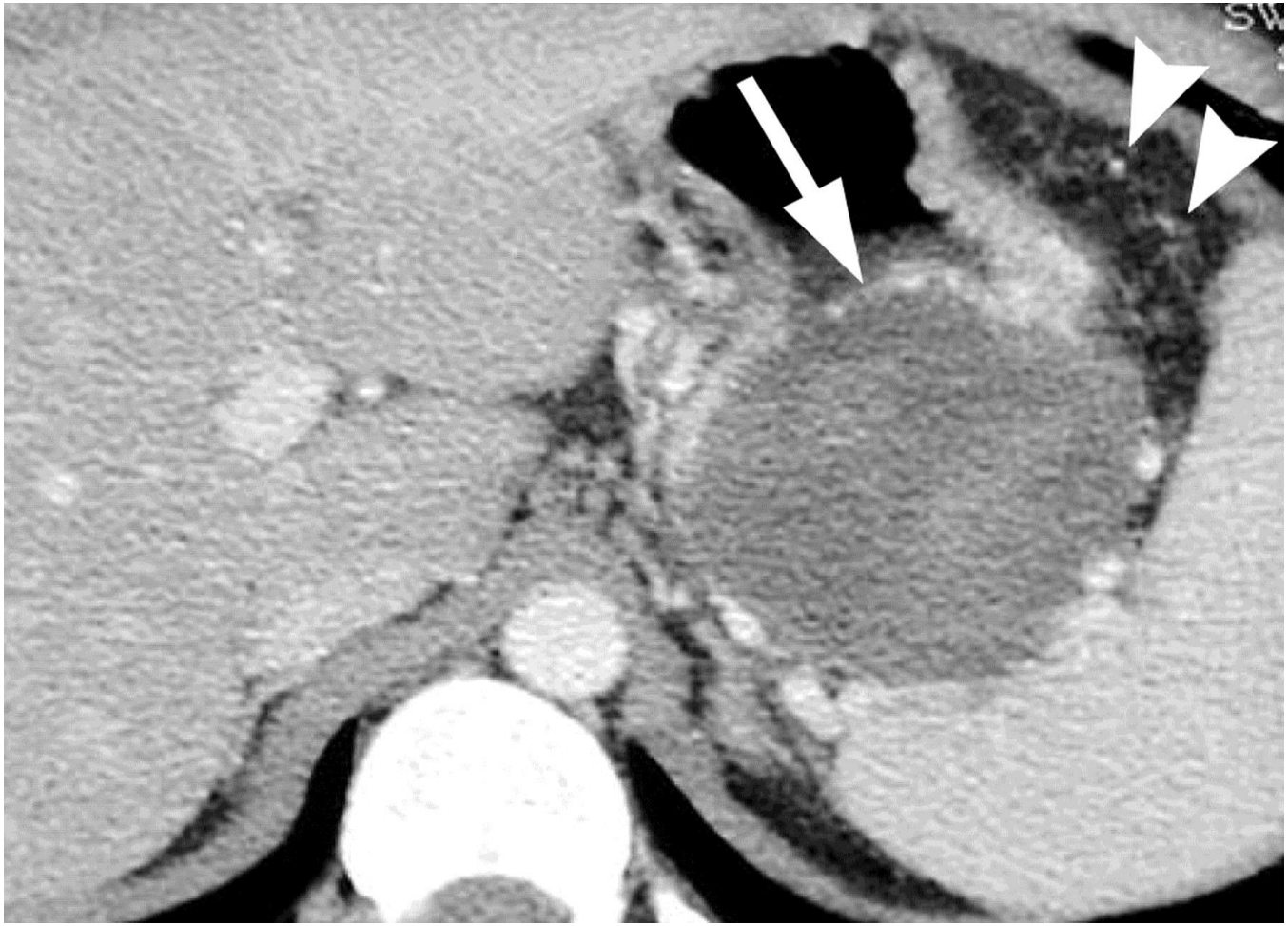


Image demonstrates a pseudocyst (arrow) in the tail of the pancreas surrounded by a thick enhancing wall. The lesion appears heterogeneous with central areas of higher attenuation, which is suggestive of fresh hemorrhage. Note infiltration (arrowheads) of the peripancreatic fat.

44 year-old man with acute abdominal pain – hemorrhagic pseudocyst

Axial CT scan obtained with intravenous contrast material demonstrates calcifications from chronic pancreatitis in the head of the pancreas. A high-attenuation focus of blood (arrow) is seen within the low-attenuation pseudocyst, a finding that is consistent with hemorrhage.

Abscess

- 1 in 20 cases and fatal in ¾ of cases
- Suspected clinically with fever and septicemia
- Pathognomonic finding → presence of gas bubbles in pancreatic bed

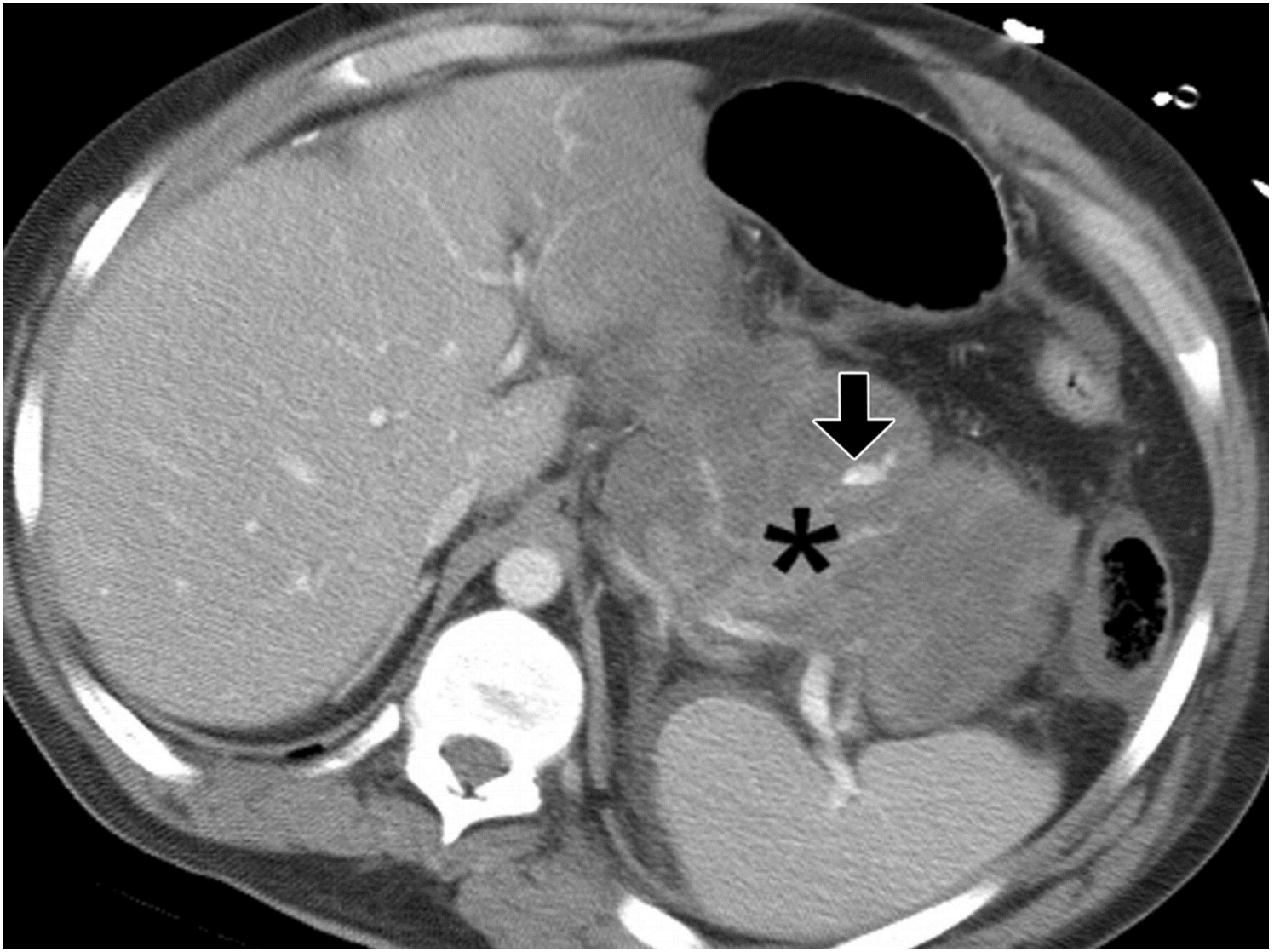
Pancreatic abscess containing gas in 54-year-old man

Large fluid collection containing gas bubbles in pancreatic bed due to abscess complicating acute pancreatitis. Note infiltration of peripancreatic fat and calcified gallstones.

Hemorrhagic Pancreatitis

- Rare
- Noted clinically by ↓ in hematocrit

70 year-old woman with hemorrhagic pancreatitis

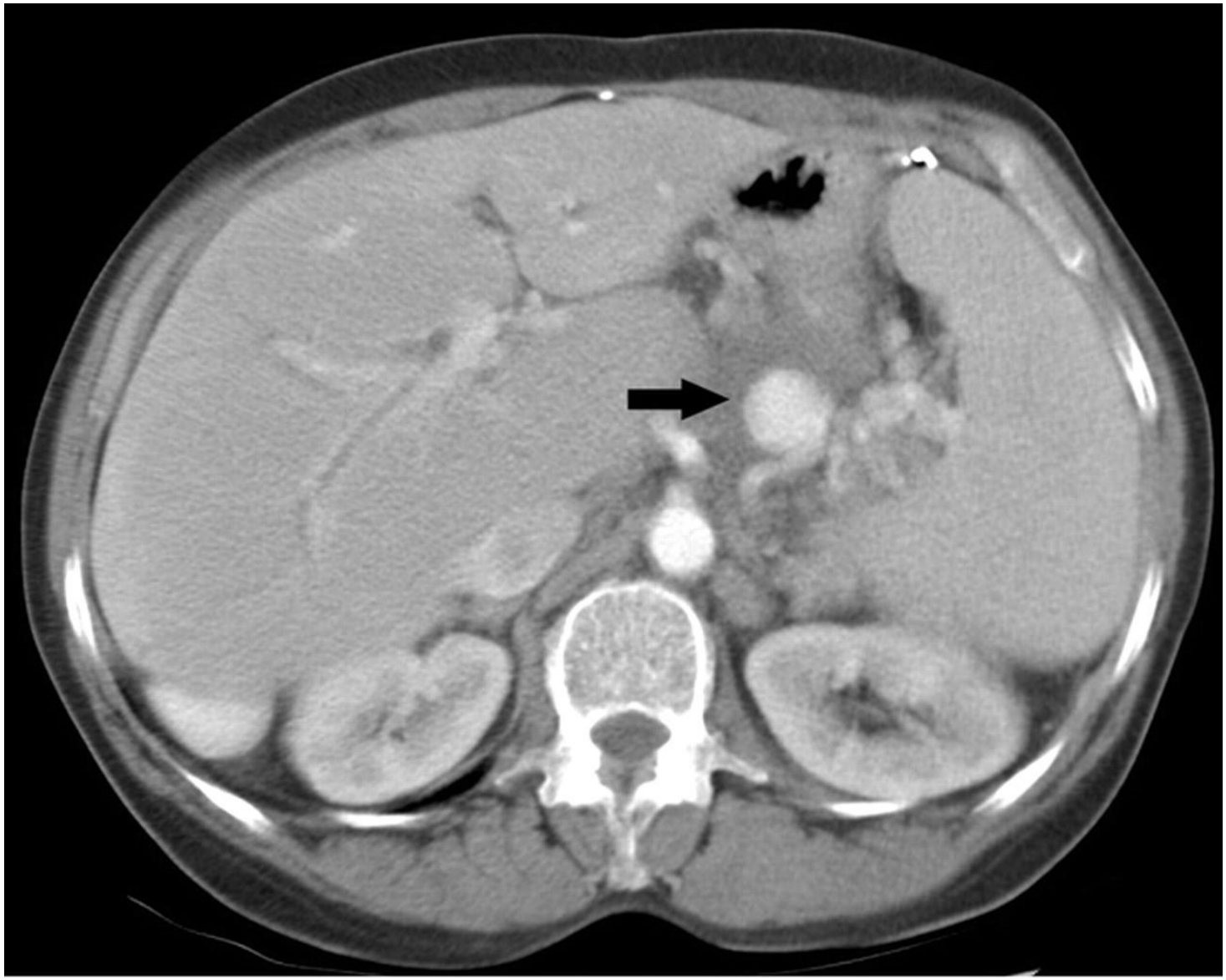


CT scan demonstrates hemorrhagic pancreatitis as a heterogeneous mass in the area of the pancreatic bed (*). Arrow indicates active extravasation (hemorrhage).

Splenic Artery Pseudoaneurysm

- Presents similarly to hemorrhagic pancreatitis with a ↓ in hematocrit

Pseudoaneurysm



Axial CT scan with intravenous contrast material reveals a pseudoaneurysm (arrow) projecting from the splenic artery.

Management


"The best doctor gives
the least medicines."
- Benjamin Franklin

Management

- Acute pancreatitis usually self-limited
  - Inflammation ↓ within 3-7 days in 90% of cases
- Medical therapy
  - Analgesics
  - IV hydration
  - Decrease PO intake → Decreased pancreatic secretion
  - Antimicrobials in severe necrotizing pancreatitis

Management

- Presence of abscess or necrosis indicates need for intervention
- Percutaneous drainage of abscess
- Surgical debridement (necrosectomy) of infected necrotic tissue when conservative treatment has failed

Prognosis

Prognosis

- Mortality ↓ over last 20 years
  - 5% for all cases
  - 20% for severe cases

Reasons for Reduced Mortality

- Initially - Recognition and application of severity signs
- 1990s – More selective endoscopic or surgical debridement of infected tissue, endoscopic cyst drainage, and angiographic control of GI bleeding
- Later – Improved nutritional support by jejunal feeding, earlier use of antibiotic therapy, gut sterilization, early ERCP for common bile duct stones, and necrosectomy for necrotic tissue